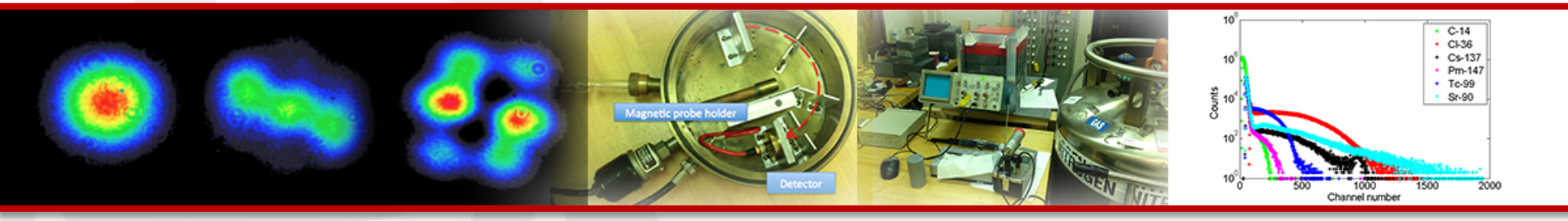
Online Peer Review in Writing Intensive Courses

Physics 331: Advanced Experimental Physics



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COLLEGE

Outline

- Introduction to the laboratory/writing intensive course *(Phys 331: Advanced Experimental Physics)*
  - Writing assignments
- Blended learning for writing scientific journal papers
- Integrated evaluation methods for writing
- Online manuscript submission and peer reviewing system
- Summary

Introduction to Physics 331

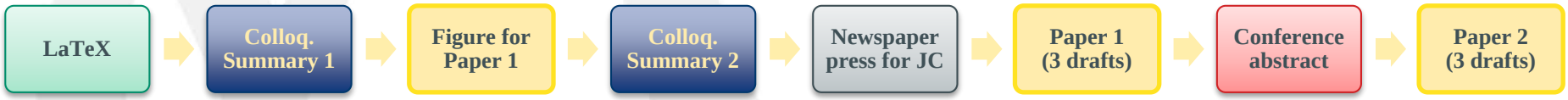
An **advanced laboratory** course consisting of set-piece experiments as well as directed experimental projects to study a variety of physics phenomena

Student learning goals:

- Exercise curiosity and creativity, develop critical, quantitative thinking, and deepen understanding of physical concepts through **conducting the experiments**.
- Develop **data analysis** skills, understand scientific errors, and learn to report the experimental quantitatively with correct significant figures and uncertainty.
- Become skilled in **using software** to generate text, equations, tables, and figures, i.e., Tek, Microsoft Word, Adobe Photoshop, Adobe Illustrator, Mathematica, KaleidaGraph, Origin
- Learn to **communicate research results** to the scientific community in the format of oral conference presentations and research papers in the style of Physical Review Letters.
- Experience the **use of writing as a tool of inquiry and critical thinking** through **feedback** and **revision.**

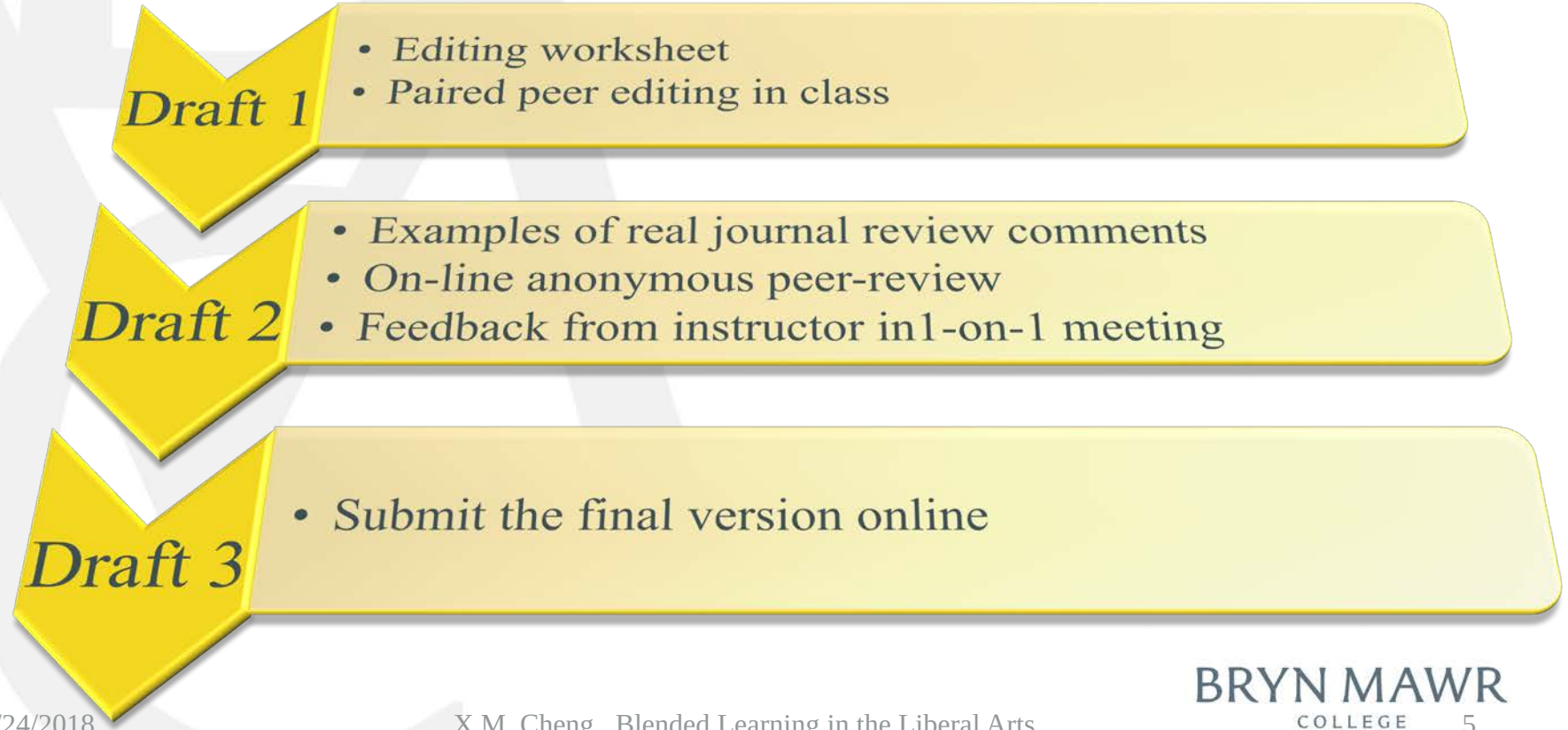
Phys 331: Writing Assignments

- Four different types (69% of the total grade)
  - 2 colloquium Summaries (10%)
  - Paper press for the Journal Club (5%)
  - 1 abstract for a mini-conference (4%)
  - 2 research journal papers (50%)
- Progressive sequence for writing assignments



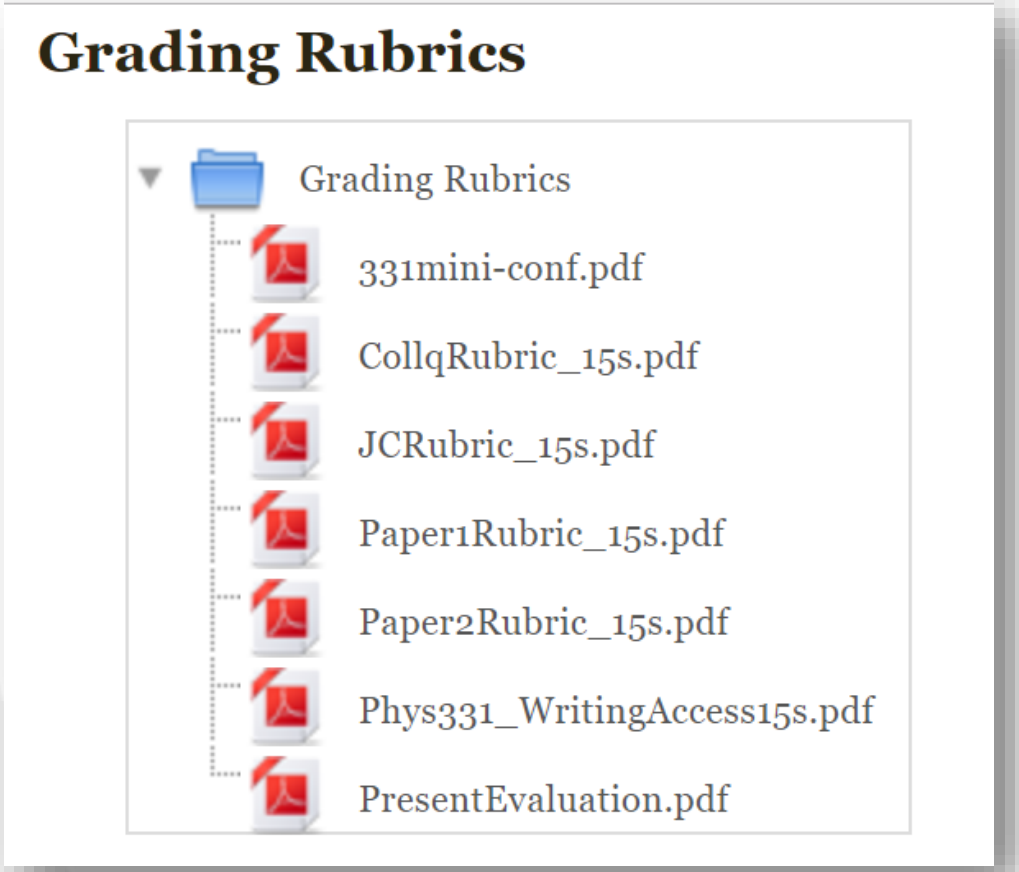
Blended learning for writing scientific journal papers

- Integrated Peer Instruction and Instructor Teaching
- Combined in-class pair sharing, on-line peer review and 1-on-1 meeting with instructor

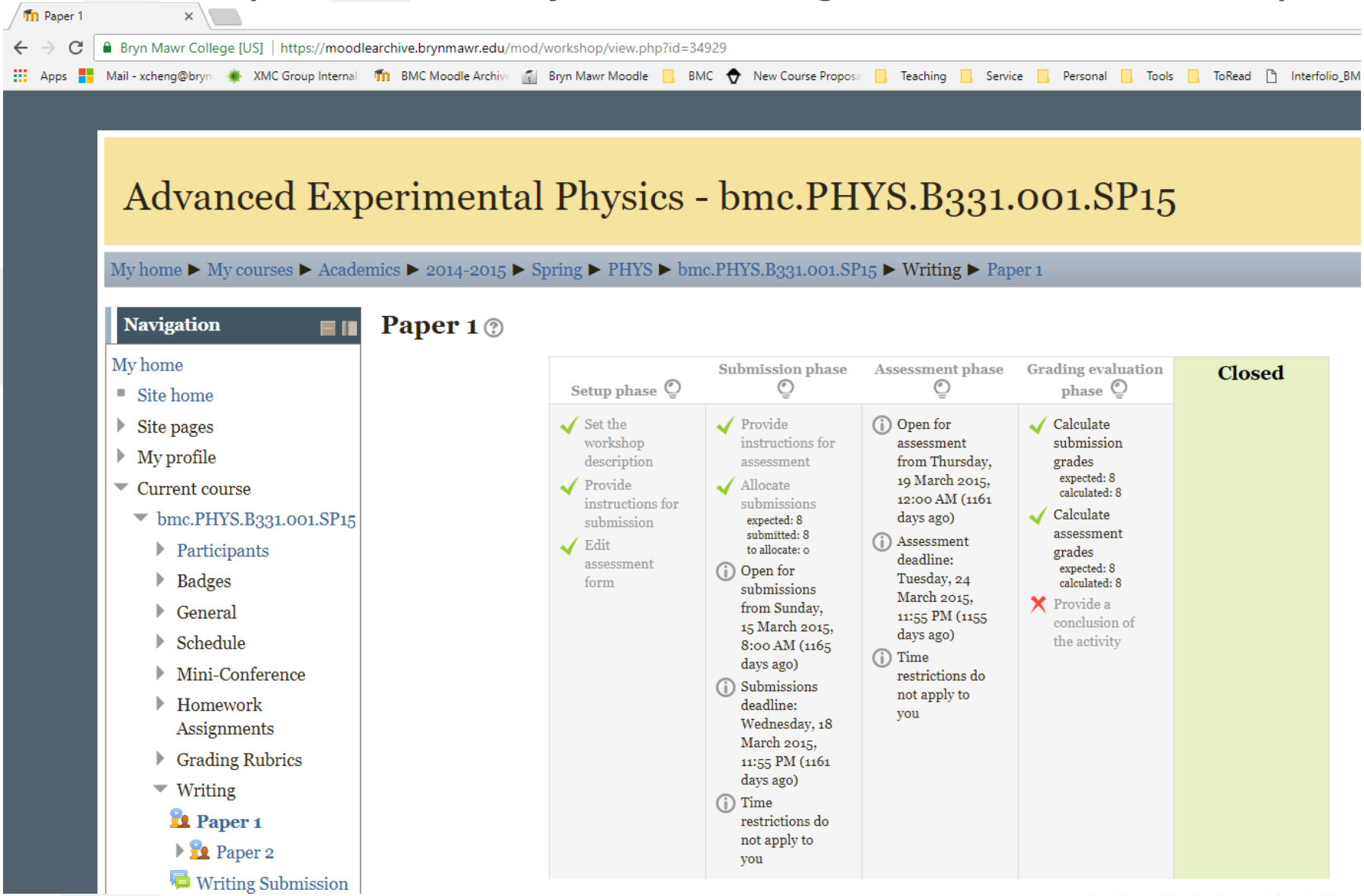


Evaluation for Writing

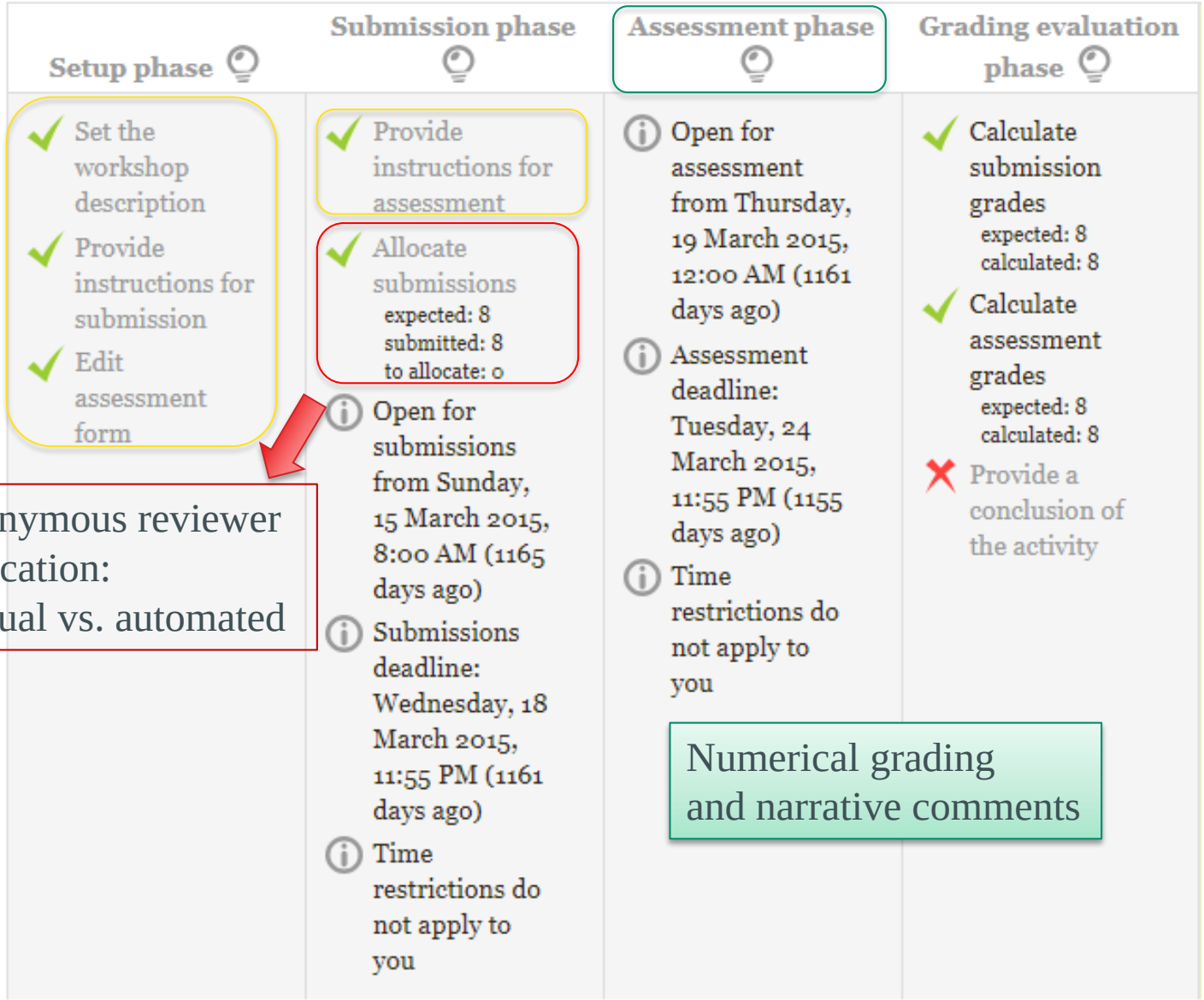
- Explicit grading rubrics
- Combination of peer review and instructor review
- One-on-one meeting to discuss the assessment result



On-line peer review system through Moodle “Workshop”



On-line peer review system



- Anonymous reviewer
- Allocation: manual vs. automated

Numerical grading and narrative comments

Assessment form for numerical grading

Criteria

Levels

Assessment form

Criteria	Levels			
Relevance (Intro): Demonstrates a clear understanding of what the problem or question is and why it is important/interesting.	Not addressed: The importance of the question is not addressed. How the question relates within a broader context is not addressed.	Novice: A generic or vague rationale for importance and broader context is given.	Intermediate: One explanation of interest is provided. Some relevant context is given for the project.	Proficient: A clear sense of why the question is of interest to the field is provided. A clear explanation of how the project relates to our understanding of this area of physics is provided. Gaps in knowledge are identified.
Context (Background): Content is accurate, relevant, and provides appropriate background, including defining critical terms, notation and equations.	Not addressed: Background info is missing or contains major inaccuracies. Background info is accurate but irrelevant or too disjointed to make the relevance clear. Primary literature references are absent or irrelevant. May contain website or secondary references only.	Novice: Background omits info or contains inaccuracies, which detract form the major point of the paper. Background is overly narrow or broad (only partially relevant). Primary literature references if present are not adequately explained.	Intermediate: Background info may contain minor omissions and inaccuracies, which do not detract form the major point of the paper. Has appropriate level of specificity. Primary literature references are relevant and adequately explained, but few.	Proficient: Background info is completely accurate. Has the appropriate level of specificity to provide concise and useful context to aid in understanding. Primary literature references are relevant and explained, indicating a reasonable literature search.
Approach (Experiment/ Calculation): Experimental design is likely to produce useful results.	Not addressed: Approach is inappropriate or poorly explained, and indecipherable.	Novice: Appropriate, clearly explained. Taken as is, as a standard approach.	Intermediate : Appropriate, clearly explained, and usefully extends a standard method.	Proficient: Appropriate, clearly explained. A synthesis of several methods or previous approaches to constitute a novel approach.
Data Sets (Results) Data are comprehensive, accurate and relevant.	Not addressed: Data are too incomplete or haphazard to provide a reasonable basis for addressing the research question. Uncertainties in the data are not identified or discussed.	Novice: A dataset is provided but some necessary data is missing or is inaccurate. Reader can evaluate some but not all of writer's conclusions. Some sources of uncertainty are identified, but not all are quantified.	Intermediate : Data are relevant, accurate and complete without any major gaps. Reader can fully evaluate whether the data support the interpretation and conclusions drawn form them. Important sources of uncertainty are identified and quantified.	Proficient: Data are relevant, accurately described including uncertainties, and comprehensive. Reader can fully evaluate conclusions and assumptions made by writer. Data may be synthesized or manipulated in a novel way to provide additional insight.
Data Presentation (Results): Data are summarized in a logical format. Table and/or graphs are appropriate, and properly labeled including units. Graphs are appropriately scaled. Captions are informative and complete.Demonstrated skills in Tek, K-Graph, Adobe Illustrator, Mathematica (in the production of figures and tables)	Not addressed: Labels or units are missing from tables or graphs, making their meaning indecipherable. Data is presented in an inappropriate format. Captions are missing, confusing, or indecipherable.	Novice: Contains some errors in labeling, scales, units, etc., but the reader can derive some meaning from tables and figures. Data presentation is technically correct, however the format prevents the reader from deriving any meaning from it. Captions are incomplete. Uncertainties are not consistently or appropriately displayed.	Intermediate : Contains only minor mistakes that do not interfere with the reader's ability to understand the meaning of tables and figures without referring to the text. Graphs and tables are appropriate for the data and include uncertainties. Captions are useful.	Proficient: Contains no mistakes. Uses a format or graph type, which highlights the relationships between the data points and other relevant aspects of the data. May be elegant, novel, or other wise allow unusual insight into the data and uncertainties. Has informative, concise and complete captions.
Data Analysis (Results): Analysis appropriate to the data set is provided (statistics, curve fitting, etc.). Correctly performed and interpreted with relevant values and uncertainties reported and explained.	Not addressed: No analysis is provided. Analysis is attempted but it is inappropriate, inaccurate, or incorrectly performed so as to have no value to the reader.	Novice: Appropriate, accurate analysis is performed, and parameters are reported. Explanation is insufficient however. Uncertainties or limits to the analysis are not discussed.	Intermediate : Appropriate, accurate analysis is performed, and parameters are reported. Explanation is complete including a discussion and quantification of uncertainties associated with the analysis.	Proficient: Analysis is appropriate, correct, complete and clearly explained. Includes a description of the validity of the results based on an understanding of the uncertainties associated with the measurements and their analysis.
Interpretation of Results (Discussion): Conclusions are clearly drawn from the data and its analysis. A logical chain of reasoning is clearly and persuasively explained. Conflicting data and/or possible alternative interpretations are adequately addressed.	Not addressed: Interpretation has little or no basis in the data provided. Connections between the data, analysis and conclusions are vague, limited, and otherwise insufficient to allow an evaluation of their merit. The impact of error, uncertainty in the result is not addressed. Missing or conflicting data are not addressed.	Novice: Interpretation has some limited direct basis in the data, but may contain some gaps in logic or be overly broad. Connections in the logical chain between the data, analysis and conclusions may be weak. Implications of uncertainties, missing or conflicting data are poorly addressed.	Intermediate : Interpretation is clearly and logically drawn from and bounded by the data provided with no gaps in logic. A reasonable and clear chain of logic from data to conclusions is made. An attempt to explain missing or conflicting data is made.	Proficient: Conclusions are completely justified by the data. Connections between the data, analysis and conclusions are comprehensive and persuasive. Conclusions address and logically refute or explain any conflicting evidence. Synthesis of data may generate new insights.
Significance of Results (Conclusion): Paper gives a clear indication of significance of the results and the implications for future research questions.	Not addressed: Future directions are not addressed. Significance of the result is not addressed.	Novice: Future directions are vague, implausible, trivial or off topic. Mentions of significance are vague or exaggerated.	Intermediate : Future directions are useful; but indicate incomplete knowledge of the context (what's been done, what techniques are available, etc.) Significance indicates limited knowledge of the field.	Proficient: Future directions are relevant, plausible and insightful. Writer explains how the current work fills in knowledge gaps and generates new questions or opportunities for future work.
Writing Quality and Style: Grammar, word usage and organization facilitate the reader's understanding of the paper.	Not addressed: Grammar and spelling errors detract from the meaning of the paper. Word usage is frequently confused or incorrect. The use of subheadings does not follow the specific journal requirements. Information is presented in a haphazard way.	Novice: Grammar and spelling errors do not hinder the meaning of the paper. In general work usage is appropriate, although the use of technical language may have occasional mistakes. The use of subheadings follows the specific journal requirements and the subheadings aid the reader somewhat. There is some evidence of an organizational strategy, though it may have gaps or repetitions.	Intermediate : Very few grammar or spelling errors. Word usage is accurate and aids the reader's understanding. The use of subheadings follows the specific journal requirements and informative subheadings delineate distinct sections. A clear organizational strategy is evident with a logical progression of ideas.	Proficient: Correct grammar and spelling throughout. Word usage facilitates the reader's understanding. The use of subheadings follows the specific journal requirements and informative subheadings significantly enhance the readability of the paper. A clear organizational strategy is present with a logical progression of ideas. There is evidence thoughtful planning for the presentation of information. The paper is easy to read.
Document Preparation in TeX: correctly formatted text, equations, and organization appropriate to the APS Style Manual	TeX file cannot be compiled to a PDF file.	TeX file can be compiled to a PDF file but the required TeX template is not used.	TeX file can be correctly compiled to a PDF file and the required TeX template is used. Demonstrated part of the required skills in Tek (correctly formatted part of the text and required other components.)	TeX file can be correctly compiled to a PDF file and the required TeX template is correctly used. Demonstrated all the required skills in Tek (correctly formatted text and required other components.)

Examples provided for narrative comments

Bryn Mawr College, Department of Physics
Physics 331: Advanced Experimental Physics
Examples of Review Comments

Xuemei May Cheng

Report of Referee A – PRL_LZ13681

In their manuscript LZ13681 "Pt Magnetic Polarization on Y3Fe5O12 and Magneto-Transport Characteristics", Lu et al, report on the detection of a magnetic moment in a metallic platinum layer in contact with yttrium iron garnet, a ferrimagnetic insulator.

The magnetic moment per Pt atom is extracted from element-selective x-ray magnetic circular dichroism (XMCD) measurements at the Pt L2,3 edges and by applying the dichroism sum rules to the XMCD data. The results are convincing, with well-defined peaks at the two edges showing a clear inversion of the dichroic signal when the magnetic field is flipped, both at 300 K and 20 K. The temperature and thickness-dependent magneto-transport characterization (AMR and OHE) shows likewise a ferromagnetic-like behavior in Pt/YIG bilayers, indicating a strong interaction at the interface region.

Minor comments:

Several typos and repetitions can be found throughout the manuscript.
A few of them are listed below but I recommend a careful proofreading.

(a) p2, line 17: "(...)SOC is can convert a pure spin current" remove “is”

(b) p3, second paragraph: a few references related to previous AMR, AHE and ANE observations in Pt/YIG should be added.

(c) p3, line 23: replace "(...) untrathin Pt thin films" with "Pt thin films"

(d) p3, line 24: replace "(...) induced Pt moment in Pt" with "induced moment in Pt"

Examples of the real review comments received for two journal papers published in Phys. Rev. Lett. and Appl. Phys. Lett. are provided to help the student write **meaningful** and **constructive** peer review comments.

Student review comments

Overall feedback

Overall Comments:

This paper is well written, and explains the background information and experimental procedure of measuring the *e/k* ratio and band gap energy clearly.

Plots, Figures, and Tables all add to the paper well.

One thing to add to is experimental uncertainty and comparison to accepted values.

Specifically, some questions to think about for this include:

What was the experimental uncertainty in the measurement of *e/k* cited?

What is the theoretical value for E_g? How does the experimental value for E_g compare to the acc
value?

Also, make sure to cite sources when describing the background information

Minor comments:

In abstract, cite temperatures from small to large i.e. "between 82 and 372 K"

Italicize letters used as variables and constants i.e. *I, T, k, e, and e/k*

There is a period after Eq. 3, but the part right after that begins in the middle of a sentence

Check placement of headings in Table 1—their placement is a little confusing in lining up with th
columns

Separate paper into sections labeled Introduction, Experimental Procedure, Results, and Conclusions

Overall feedback

This is a good experimental work, using measurements of the current-voltage relationship of a semiconductor under different temperatures to determine the electron charge e and Boltzmann's constant k ratio.The theory component of the paper explains the determination of e/k ratio well. The figures and diagram of the circuit are very clear.

The paper lacks strong connection between the experimental data and current research. In the conclusion part, the significance of the experimental work is too general. How does the e/k ratio help us with understanding of physics concepts? How is the band energy gap related to properties of semiconductors?

Although the experiment setup is well explained, the data and results component of the paper can be improved more. Rather than showing the data and tell what the calculations are, the paper can provide more data analysis and interpretation. One way it can be done is to incorporate theoretical introduction with data. In that case, there is a natural transition between theory and experimental results.

The text and data column in the tablized data table can be better aligned.

I find the study really interesting especially in how the equations and figures in this paper tell the story.

Overall a well-written paper with clear figures and interpretation of the figures. Suggestions of improvement are noted above.

Peer review results

Workshop grades report

First name / Surname	Submission	Grades received	Grade for submission (of 10.0)	Grades given	Grade for assessment (of 5.0)
	Paper 1Draft2	9.0 (5.0) 7.7 (5.0)<	8.3	9.0 (5.0)> 8.7 (5.0)>	5.0
	Paper 1Draft2	5.3 (5.0) 4.7 (5.0)<	5.0	6.0 (5.0)> 3.7 (5.0)>	5.0
	Paper 1Draft2	8.0 (5.0) 7.7 (5.0)<	7.8	9.0 (5.0)> 7.0 (5.0)>	5.0
	Paper 1Draft2	6.0 (5.0) 5.0 (5.0)<	5.5	7.7 (5.0)> 8.0 (5.0)>	5.0
	Paper 1Draft2	9.0 (5.0) 7.7 (5.0)<	8.3	5.3 (5.0)> 5.0 (5.0)>	5.0
	Paper 1Draft2	7.7 (5.0) 8.0 (5.0)<	7.8	7.7 (5.0)> 8.0 (5.0)>	5.0
	Paper 1Draft2	3.7 (5.0) 7.0 (5.0)<	5.3	4.7 (5.0)> 7.7 (5.0)>	5.0
	Paper 1Draft2	8.7 (5.0) 8.0 (5.0)<	8.3	7.7 (5.0)> 8.0 (5.0)>	5.0

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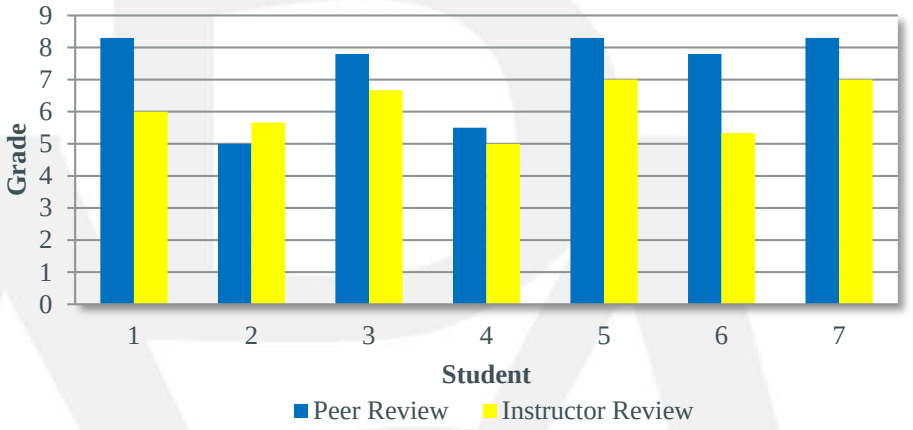
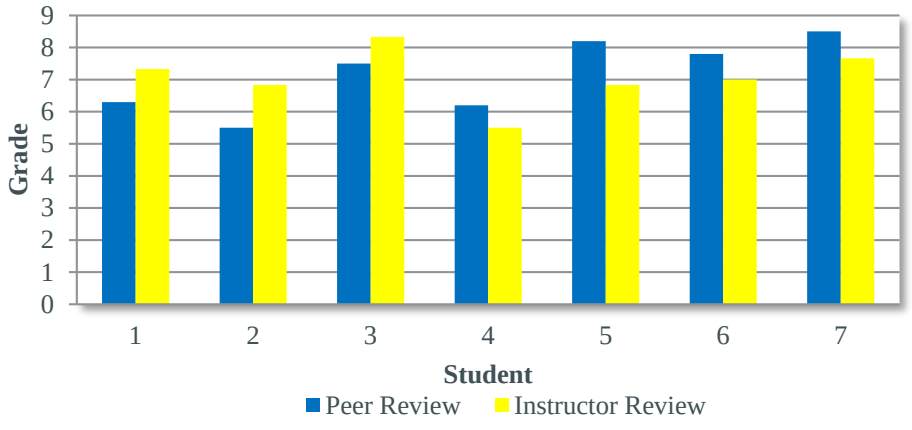
Assessment Results

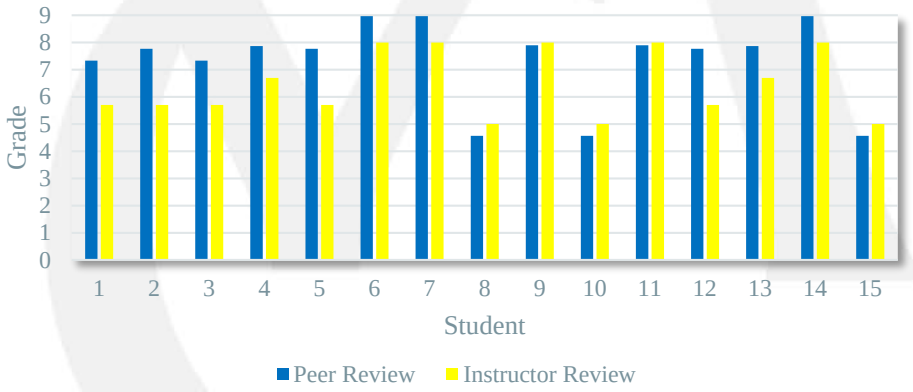
Paper 1 (Spring 2015)



Paper 2 (Spring 2015)



Paper 1 (Spring 2017)



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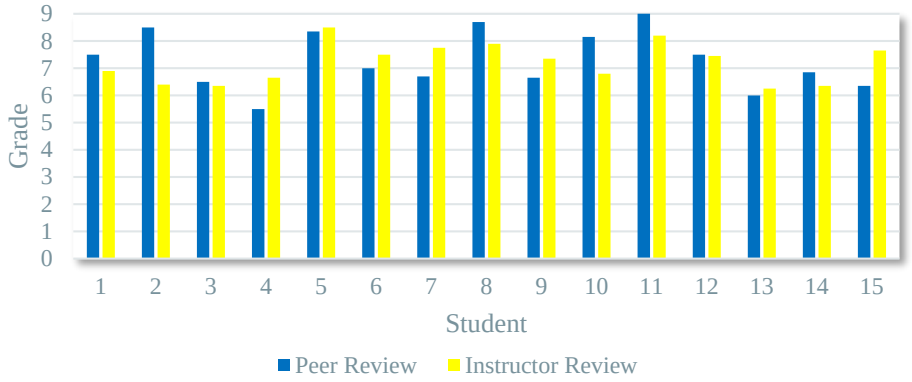

Summary

- Blended learning for scientific writing in an advanced physics laboratory course.
- An online manuscript submission and review system that resembles the real journal paper submission and review process in physics has been implemented through the "Workshop" function of Moodle.
- The advantages include:
  - anonymous peer review process
  - high efficiency for assigning review tasks
  - automatic numerical grading
  - convenient statistics analysis